Medical Refrigerator/freezer

- Medical refrigerator/freezers are important in immunization and treatment programs – especially in rural health clinics. These units can be powered by a mini-grid, micro-hydroelectric, wind or PV systems. Generally, the units require battery backup to ensure continuous, uninterrupted operation.

- Shown was an energy efficient refrigerator/freezer combination, which is WHO approved. Energy consumption at 32 C ambient temperature is listed as 24 amp-hours per day at 12 V.

Water – Pasteurization

- Pasteurization is an effective water treatment technology for disinfecting water with heat. Solar thermal systems are a sustainable solution that avoids the use of precious and often expensive fuels such as wood or kerosene. System types can be either batch or flow through. For a batch system, water is poured in, heated and then emptied. For a flow through system, water flows through the system at a specific rate so that the water is above a certain temperature for a certain time.
- Shown was a batch solar water pasteurizer. The unit holds 13 liters and can treat one batch of water in 2-1/2 to 3 hours on a hot sunny day. A pasteurization indicator inside the black cap shows when the water is safe to drink.

Water – Slow Sand Filters

- Slow sand filtration is a very effective and low cost water treatment process. The water is gravity fed - no external power is needed. Most slow sand filtration systems are built on site but can be made off site and shipped to a location. As water filters through the different sand layers impurities are filtered out. A biofilm layer that forms on the top sand surface is the most important layer filtering out bacteria and protozoa.

- The water filter shown is capable of filtering water at a rate of 20 liters/hour. Water is poured in at the top and collected from the faucet.

Water - UV Sterilization

- Ultraviolet sterilization is an effective, energy-efficient water treatment process. The contact time (light intensity and water flow rate) of the water with the UV light determines the purification effectiveness. UV light is very effective on viruses and bacteria, and can be effective on protozoa at high dose rates. The germicidal UV bulbs are similar to fluorescent lights and have similarly low power requirements.
- The model shown is rated at 15 l/min. The unit is a gravity flow design - no pressurization needed. A safety solenoid on the water input closes when there is no electricity for the UV bulb.

Water Distiller

- Water distillation produces pure, clean water for health clinics or drinking. Distillation units generally require a high temperature heat source such as a cook stove. Solar distillation units that use sunlight are in use.

- Shown was a distiller that can be used for health clinics and emergency situations. A cook stove (or any other source of heat) boils the water in the lower section. The water vapor condenses against the bottom of the upper section that is filled with cool water. The distilled water drains out the stainless steel spout. The unit can produce up to 4 liters in 40-45 minutes.

Water Pumping

- Water is crucial to life and health. Water pumps - surface or submersible - can be powered by renewable energy systems without worry about fuel costs or supply interruptions. A wide range of pumps are available for every application depending on the required flow rates and pumping heads.

- Shown was a DC-powered submersible well pump that can pump up to 7.5 l/min and with a lift up to 70 m. The pump can be directly powered from a PV module. AC-powered submersible well pumps are available for direct connection to a wind turbine.

Photovoltaic (PV) Power

- PV modules produce DC electricity directly from the sun with no moving parts. Most PV modules are designed to charge 12 V lead-acid batteries. Modules with other voltages can be made for lower voltage batteries used in some solar lanterns and radios. All PV modules are rated to produce power at a full sun condition of 1000 W/m^2. PV modules that meet international testing standards can last 20 or more years in the field. Most major manufacturers warranty their modules for 20 years or more.
- Shown was a module rated at 50 W. The module can produce 3.3 A at 16.7 V. The large junction box on the back makes it easy to wire in the field.

Solar Cookers

- Solar cookers are being used in most every country. The use of solar cookers reduces the need to gather or buy firewood or other fuels. In many countries wood is scarce and women spend several hours a day to find wood just for that day.
- There are 3 main types of construction: a panel cooker using flat mirrors; a parabolic cooker using a parabolic shaped mirror for a line focus; and a box cooker (shown here).
- Most all food can be cooked in a solar cooker. The long, slow cooking prevents food from burning.

Battery Charging Systems

- Battery charging systems can be used in a micro-enterprise situation charging batteries from a centralized wind, PV, biomass or micro-hydroelectric system. Users bring their batteries to the charging station and return home with a fully charged battery. In some situations this is an effective way to bring power to a region or to offset generator-based battery charging enterprises.

- Shown was a battery charging system that can charge an individual 12 V battery. This unit is designed for 3-phase AC input power directly from a wind turbine.